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ABSTRACT

The first of five sections in this paper describes the role of the Agency for Instructional Technology (AIT) in the formation of consortia for the development of curricula and the production of learning materials using electronic technologies in the United States and Canada. The processes of instructional design and formative evaluation adopted by AIT are outlined in the second section. It is noted that programs such as "MATH WORKS" developed by the agency emphasize higher-order cognitive skills and incorporate the learning principles of active participation, sequencing, chunking, and congruency. Formative evaluation is described as a process which focuses on the four criteria of student attention, student comprehension, the nature of classroom interaction, and the appeal of the lesson to students and teachers. Noting that final responsibility for the use of video technology rests with the teacher, the third section describes the features of AIT video programs that make them especially appealing to teachers. The fourth section briefly reviews alternative delivery systems, including broadcast and cable television, microwave, satellite, and videocassette, and presents reasons for the particular success of videocassette recordings. Finally, consideration is given to the cross-cultural adaptation of instructional materials originally developed for U.S. and Canadian schools. (4 references) (GL)

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Agency for Instructional Technology
Programming for Today's Learner

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An Overview of Design, Implementation, and Transfer Considerations for the International Use of Instructional Video

Focusing on
the Co-operative Development Process
of the Agency for Instructional Technology

Presentation at the
International Symposium on the Use of Broadcasting in Education
Hiroshima, Japan
October 25, 1989
Sponsored by Nippon Hoso Kyokai (NHK)

In Conjuntion with the
The All-Japan Teachers' Federation for
Studying the Use of Radio and Television inEducation

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Agency for Instructional Technology

The Agency for Instructional Technology (AIT) develops curricula and produces learning materials for American-Canadian schools. Established as an instructional television research project in 1962, AIT is charged with strengthening education through technology. AIT produces and distributes video, computer, and printer based instructional materials in cooperation with state, provincial, and international agencies. AIT is a non-profit organization located in Bloomington, Indiana, U.S.A.

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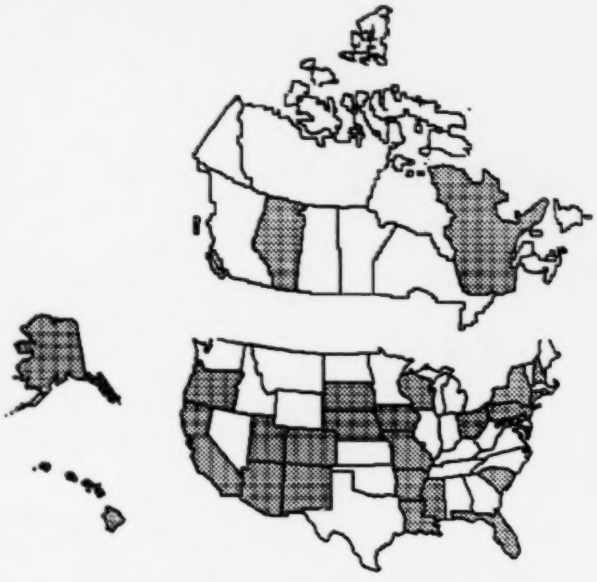
Introduction

In the United States, the 50 state governments, not the Federal government, control education. Canada's ten provinces have a similar system. Thus, 60 different bureaucracies are responsible for education in the two nations. These state and provincial departments of education share common cultures and curricula and co-operate whenever possible in a wide range of activities.

AIT was created to manage their co-operative development of new curricula and production of learning materials using electronic technologies. AIT is a non-profit organization governed by leading educators from the state and provincial education organizations.

AIT forms a consortium of interested state and provincial education agencies in the U.S. and Canada to fund design and production of learning materials. Thus far, 29 different consortia have created learning materials which are used throughout English-speaking North America and around the world.

A consortium unites as many as 60 education agencies in the design and evaluation of pedagogic materials; AIT manages the project and supervises production of materials. Subsequently, the schools within these member agencies have unlimited rights to use the materials in their classrooms.



Members of MATH WORKS Consortium

These materials have been successful because the co-operating agencies have committed their time and energy, as well as their intellectual and financial resources, to make sure the materials are designed and produced to meet their own needs. In addition, the states and provinces have worked to ensure that teachers have access to the programming, are trained to use it, and have the necessary related resources to facilitate its effective use.

The states and provinces make a significant financial contribution to the development of these materials. The 29 major sets of materials cost $33,565,656 to produce; the majority of the funds came from state and provincial fees based on student populations, other funds came from grants and AIT. The following chart illustrates the investment made by the entire system and two states:

State/ Province	Number of Series	Participant's Share	Total Cost of the Series
All 60	29	$25,360,481	$33,565,656
Alabama	11	355,555	19,253,882
Alaska	23	311,966	28,894,156

Alabama paid more for 11 series than Alaska paid for 23 series because Alabama has a substantially larger population. Note that Alaska received 23 sets of materials for an investment of $311, 966; those materials are valued at $28,894,156. Obviously, co-operative development can be very cost efficient. More importantly, each member of the consortium helps design and evaluate the materials.

Instructional Design and Formative Evaluation

AIT "strengthens education through technology" by encouraging the use of technology in the classroom, especially video and computer. It is experimenting with videodisc and has, in the past, even produced filmstrips and audiotapes. However, AIT does not emphasize the word "technology" in its name; rather, the emphasis is on "instructional." AIT relies heavily on the science of teaching, recognizing that **how** is as important as **what** students learn. For example, AIT's instructional videos are based on several general considerations about learning:

Learning will increase if the learner knows explicitly what is expected.

Students learn most effectively when they start with familiar situations before moving to new situations and problems.

The greatest amount of learning occurs when skills are developed and practiced in situations similar to those in which they will be applied.

Effective instruction emphasizes active rather than passive learning.

Effective instruction encourages the development of skills that are transferable from one context to another.

An illustration of students learning most effectively when they start with a familiar situation is contained in AIT's "Measurement: Finding Areas of Rectangles" from the MATH WORKS series. The program creates a scene easily understood by American pupils: two "target-age" children earn money by mowing grassy lawns for their neighbors (a common practice in the U.S.). Because they base their fee on the size of the lawn, they must know how to calculate the area of a rectangle. The program follows them as they invent the formula "A = L x W" in the context of an everyday, not classroom, situation. The program is designed to emotionally involve viewers as they witness their peers using the discovery process to learn and practice in a familiar situation.

What do pupils learn from watching the program? The formula to determine the area of a rectangle? The skill to apply that information? The strategy to manage their own learning process? The desire to learn more about mathematics? As these questions suggest, learning involves more than just memorizing information. There are five broad categories of learning:

information– verbally stating facts or generalizations

intellectual skills– applying learned information

cognitive strategies– self-managing learning

attitudes– choosing personal action

motor skills– executing body movement (Gagné, 1974)

The program "Measurement: Finding Areas of Rectangles" does not simply state the information "A = L x W" and tell the viewers to memorize it. By observation and subsequent classroom practice, students learn to use intellectual skills, such as problem-solving, to apply known rules to new situations. They learn to use cognitive strategies, such as critical thinking, to manage their own learning processes. They develop positive attitudes towards mathematics by watching peers successfully cope with a difficult problem.

Teachers cannot create tools like MATH WORKS by themselves; they lack the time, materials, expertise, and funding. Successful learning materials must have high technical, creative, and instructional quality. They should be integrated with other media so that they complement other classroom activities. They should have a carefully considered sequence of instruction, with each lesson building on preceding lessons. Finally, the content of the series of lessons should be new enough to facilitate improvement in classroom practice, but not so new as to require disruption of existing curricula (Middleton, 1979).

These learning materials must be created by experts with the appropriate training and resources. For example, AIT's instructional designers cite the following principles of learning:

Active participation—forcing students to think along with the presentation

Sequencing—from the simple to the complex, the familiar to the unfamiliar

Chunking—presenting the right amount of information for the development level of the students

Congruency—eliminating whatever is not tightly relevant (Thiagarajan, 1988)

Adherence to these principles allows the creation of highly sophisticated materials. The MATH WORKS program features two children coping with a mathematical modeling problem. One of them has a rigid, literal perspective and cannot comprehend abstractions (this requires a cognitive strategy); the other child gradually offers enlightenment with the recurring use of one simple word: pretend. The program also presents the same information about the mathematical formula in three different situations: drama, teacher lecture, and animation. Thus, students are exposed to repetitive messages from different points of view, each presented in highly motivating situations.

The instructional design of AIT programming is verified and refined through evaluation by teachers and other subject-matter experts; subsequent production of learning materials is based on that design. The materials then go through formative evaluation with preliminary drafts of scripts, videos, and teacher's guides being tested in classrooms and then modified as the research suggests. Formative evaluation focuses on four criteria: student **attention** to the lesson, student **comprehension** of content, the nature of classroom **interaction** stimulated by the lesson, and the **appeal** of the lesson to students and teachers (Middleton, 1979).

Teacher Planning

Education researcher Bill Taylor (1981) points out that "teacher planning begins with materials rather than objectives, learner analysis, or other "front-end" steps our models prescribe. Teachers plan from materials, not to materials as our theories have held." He lists five essential questions that teachers ask when selecting instructional materials:

Are these materials within my curricular area?

Will these materials be available when I want to use them?

Is the preparation time reasonable?

Are these materials compatible with my classroom management style?

Will these materials help me engage the interests and energies of my students?

Finally, Taylor quotes a teacher on the importance of immediate access:

> "Availability means nothing; accessibility is everything! Films are available in the county library -- so what? You have to order weeks in advance, and there's no guarantee that you'll get them when you need them. For teachers to use media properly and effectively, it must be accessible to them in the building -- at arm's length."

With pre-produced instructional videos, a teacher can create a lesson that draws on resources far removed from the classroom. For example, sequences from GLOBAL GEOGRAPHY show deforestation in Nepal and resulting soil erosion and population shifts. Or, PRINCIPLES OF TECHNOLOGY sequences about mechanical resistance teach "drag force" by showing airplanes in flight, with graphic overlays illustrating the concepts. They teach "friction" by showing the brakes on the flight deck of an aircraft carrier stop a jet airplane -- in two seconds. Through video, teachers can bring experts and their demonstrations into classrooms while maintaining control of interaction with the students and the way the program is shaped into

learning experiences. By doing so, teachers are finding that more students are engaged in learning more of the time, that those who miss the impact of one method may be affected by another.

Final responsibility for and control of technology in the classroom rests with the teacher. Instructional video programs are designed to make this job as easy as possible: a typical teacher's guide contains a summary of each program; a statement of objectives or goals; suggestions for preparatory activities; follow up activities; a glossary of vocabulary; lists of useful equipment; readings; and a textbook or curriculum correlation matrix. For example, MATH WORKS and GLOBAL GEOGRAPHY contain charts bound into the teachers' guides that correlate the indiviual video programs with commonly used mathematics and social studies textbooks.

Delivery of Instructional Video Programs

There are a variety of delivery systems available: broadcast television, microwave, satellite, cable, and videocassette. Each has its own attributes and all can be used successfully to deliver programs to the classroom. Broadcast television, the original delivery system, is still a powerful force because of its ability to beam programs to a large geographic area simultaneously. A growing number of schools are recording programs off-air and keeping the tape in their libraries, giving flexibilty to classroom schedules. Copyright clearances are prearranged in those cases.

Increasingly, the videocassette is becoming the medium of choice because it permits teachers to control scheduling the programs. A videocassette player in the classroom permits the most accessibility, flexibility, and freedom for the teacher and class and allows the teacher to interrupt the program to answer questions and lead discussions. Another advantage of videocassettes is economy. It is far less expensive to supply thousands of classrooms with VCRs, monitors, and entire libraries of programs than it is to construct even one television station.

Accessibility to the programs is essential. A good instructional video can be useful for many years; each year a new group of students will be ready to view it. Therefore, the delivery system should encourage long term accessibility and use.

Adapting AIT Materials

AIT is actively seeking mutually beneficial curricula-sharing projects around the world. For example, AIT worked with geographers and television crews in 14 countries to produce GLOBAL GEOGRAPHY. AIT also assists educators in other countries in importing curricula and related learning materials that were originally developed for U.S. and Canadian schools.

To use AIT programs outside English-speaking North America, many changes may have to be made: translations, technical conversion of videotapes, and cultural adaptations. The adaptation process relies on the original AIT instructional design to produce of quality, locally attuned, educational materials. AIT offers, and encourages agencies to use, its formative evaluation process during adaptation, ensuring that the new programs are appropriate to their new setting.

In some cases, English-speaking schools outside the United States and Canada use the original programs. In other cases, the programs are translated, a local host is added, or new printed material is created to assist teacher use and student understanding. Occasionally, new video footage is inserted to ensure that the programs present local cultural values. In all cases careful attention is paid to the creation of programs that meet local curriculum needs.

There are several examples of this transfer of instructional technology. PRINCIPLES OF TECHNOLOGY is being adapted for use in nations as different as Bophuthatswana, Brazil, Mexico, and Turkey. In all four cases, AIT's design and evaluation methods are being used to

enable producers to create materials that meet the special needs of each country. Just as this transfer of technology can be a shortcut for developing nations, more industrialized nations are also adapting North American materials to save time in the development cycle. For example, by adapting MATH WORKS and IT FIGURES rather than producing new programs, one nation was able to introduce its new mathematics curriculum ahead of schedule and under budget.

Those are two of AIT's three favorite phrases: "ahead of schedule" and "under budget." Of course, the first is "teaching children."

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